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PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

An Improved Safety Device for Cranes

We, HILGERS A.G., a German Company of Rheinbrohl, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to an improved safety device which is particularly, although not exclusively suitable for use on the mast of a climbing crane which is adapted to be borne by at least two stationary clamping frames anchored on different finished stories of a new building.

As each storey of a new building is finished a climbing crane of this type is raised through the finished storey by means of its own driving mechanism on a special climbing or winching mechanism which is usually provided on the top clamping frame. Thus, whatever the height of the building under erection, the crane used can be relatively small and inexpensive as compared with known, rotating tower cranes which bear on the ground.

Difficulties are encountered with climbing cranes of the above kind in guiding the mast through the clamping frames during the climbing operation and, furthermore there is a risk of serious accidents occurring during the climbing operation should the winching mechanism break and allow the mast to fall.

It is an object of the present invention to provide a safety device, for use in a climbing crane, which will obviate the risk of accidents during the climbing operation and facilitate guiding of the mast through the clamping frames.

According to the invention there is provided a safety device for use with a vertically movable mast, wherein the mast is formed with a number of horizontally disposed locking faces and the safety device comprises a frame adapted to seat on a fixed support member

and a pawl pivotally mounted on an intermediate member which is attached to the frame wherein the pawl is biased into locking engagement under a locking face on the mast and means are provided on the device for limiting pivotal movement of the pawl under the weight of the mast.

Preferred forms of the invention will now be described with reference to the accompanying diagrammatic drawings, in which:—

Figure 1 is an elevation of a climbing crane held at two floors of a building with the aid of safety devices according to the invention,

Figures 2 and 3 are respectively a part sectional elevation and a part sectional plan view of one of the safety devices of Figure 1 locked on the crane mast,

Figures 4 and 5 are respectively a part sectional elevation and a part sectional plan view of a modification of the safety device shown in Figures 2 and 3.

Figures 6 to 9 are elevations of four modifications of the crane mast adapted for use with the safety device of the invention, and

Figures 10 to 13 are sections taken on the lines X—X, XI—XI, XII—XII and XIII—XIII of Figures 6 to 9 respectively.

In Figure 1 a climbing crane is indicated generally at 20.

The climbing crane 20 comprises a crane mast 21, a jib 22 and a slewing connection 23. The crane mast 21 passes through gaps 24, 25 and 26 in the floors 27, 28 and 29 respectively of a building which is in process of erection. On the upper floor 29 and lower floor 27 are similar clamping frames 30 and 31 respectively which surround the crane mast 21 and with the aid of safety devices according to the invention hold it in the position shown, against vertical downward movement.

The climbing frame 30 is shown in greater detail in Figures 2 and 3 and comprises bearer

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members 32 which support similar safety devices in the form of locking mechanisms 33.

Each locking mechanism 33 comprises an intermediate member 34 having two bearing plates mounted on extensions 35 projecting from the bearer member 32 by a pivot 36, a pawl 37 which is mounted on the bearing plates of the intermediate member 34 by a pivot 38 and a spring loaded plunger 39 which is integral with the intermediate member 34 and which is permanently urged against the pawl 37.

Mounted on the bearer member 32 is an adjustable thrust screw 40 which bears against a thrust plate 41 integral with the intermediate member 34.

A vertical strut 42 of the crane mast 21 is formed with apertures 43 which are spaced at regular intervals along its length to provide horizontally disposed locking surfaces 43a and the pawl 37 of each locking mechanism 33 is spring-urged downwards by the plunger 39 into locking engagement under the locking surface 43a of an aperture 43 in the strut 42.

The pawl 37 is held in any convenient manner against further rotation and downwards movement from the position shown in Figure 2, for instance, in the embodiment shown, by catching between the upper locking surface 43a and the bottom edge of the aperture 43, and thus the crane mast 21 is held by the pawls 37 against vertical downward movement.

The thrust screw 40 is adjustable to move the intermediate member 34, through the thrust plate 40, into engagement against the strut 42 of the crane mast so as to allow tolerance in the positioning of the bearer members 32 relative to the crane mast 21 and to provide means for lateral adjustment of the crane mast during the climbing operation.

In order to move the crane vertically upwards any convenient winding mechanism may be employed. For instance the mast 21 may be suspended on a wire rope or climbing chain by means of a block and tackle comprising rope rollers or chain rollers.

As the mast 21 moves vertically upwards the pawl 37 is pivoted upwards, upon engagement with the lower edge of the aperture 43 in which it is located, so as to be disengaged from the aperture and then snaps back, under the pressure of the plunger 39 under the locking face of the succeeding aperture. Lateral guidance of the mast 21 is provided by adjustment of the thrust screws 40.

Upon completion of the climbing operation the pawls 37 engage and lock in the apertures 43 in the strut 42 thus preventing the crane from dropping. The thrust screws are tightened to lock the intermediate member 34 against the mast 21 and the weight of the crane is thus transmitted through the lock-

ing mechanisms 33 to the bearer members 32 and therethrough to the floors of the building which have already hardened sufficiently to take the load.

The bearer members 32 extend round the four sides of the crane mast 21 and preferably two of the locking mechanisms 33 are provided at each corner of the mast, as shown in Figure 3. The apertures 43 in the two flanges of the strut 42 may be staggered so as to ensure that the pawl of one of the two locking mechanisms at each corner of the mast is engaged within an aperture 43 in the strut at all times during the climbing operation.

If desired, the pawl 37 may be constructed so as to be gravity biased into the locked position shown in Figure 2 and the plunger 39 may then be dispensed with.

Figures 4 and 5 illustrate a modified locking mechanism which is indicated generally at 50.

The locking mechanism 50 comprises a pawl 51 which is pivoted between two extension plates 52 formed on a bearer member 53 by a pivot pin 54. The lower end of the pawl 51 is permanently urged, by means of coil springs 55, towards the bearer member 53 thus pivoting the upper end, which constitutes a latch 56 outwardly and into permanent engagement with the locking face of ratchet teeth 57 formed on a vertical strut 58 of the crane mast.

A thrust screw 59 is provided on the bearer member 53 so as to limit movement of the lower end of the pawl 51 in a direction away from the strut 58 and towards the bearer member.

In operation, as the crane mast is raised the latch 56 of the pawl 51 passes over the ratchet teeth 57, pivoting about the pin 54 against the force of the coil springs 55.

When the weight of the crane is released the latch 56 locks under the locking face of one of the ratchet teeth to take the full load and prevent the crane from dropping.

As the load falls on the pawl 51 it pivots around the pin 54 until further movement is prevented by the thrust screw 59. Thus the load is transmitted through the pawl 51 and thrust screw 59 to the bearer member 53 and therethrough to the floor of the building.

Figures 6 to 13 illustrate four preferred structures of the vertical strut of the crane mast against which the locking mechanism of the invention may be engaged in the manner described above.

In Figures 6 and 10 a vertical strut is shown having recesses formed in its vertical side edges for engagement with the pawl of the locking mechanism.

In Figures 7 and 11 a vertical strut is shown having ratchet teeth and similar to the strut 58 of Figures 4 and 5.

In Figures 8 and 12 a vertical strut is

5 shown having raised abutments under each of which the pawl of the locking mechanism will engage and, in Figures 9 and 13 a vertical strut is shown having apertures and similar to the strut 42 of Figures 2 and 3.

WHAT WE CLAIM IS:—

10 1. A safety device for use with a vertically movable mast, wherein the mast is formed with a number of horizontally disposed locking faces and the safety device comprises a frame adapted to seat on a fixed support member and a pawl pivotally mounted on an intermediate member which is attached to the frame, wherein the pawl is biased into locking engagement under a locking face on the mast and means are provided on the device for limiting pivotal movement of the pawl under the weight of the mast.

20 2. A safety device as claimed in claim 1, wherein one end of the pawl is biased into locking engagement with the mast and rotation of the pawl in the direction of the bias is limited by a thrust member acting on the other end of the pawl.

3. A safety device as claimed in either preceding claim wherein the thrust member is adjustably mounted on the framework.

4. A safety device as claimed in any preceding claim wherein the pawl is gravity biased.

5. A safety device as claimed in any preceding claim, wherein the intermediate member is pivotally attached to the frame.

6. A safety device as claimed in claim 5 wherein the intermediate member is gravity biased away from the framework and towards the vertical movable mast.

7. Safety devices substantially as described herein with reference to Figures 2 and 3 or Figures 4 and 5 of the accompanying diagrammatic drawings.

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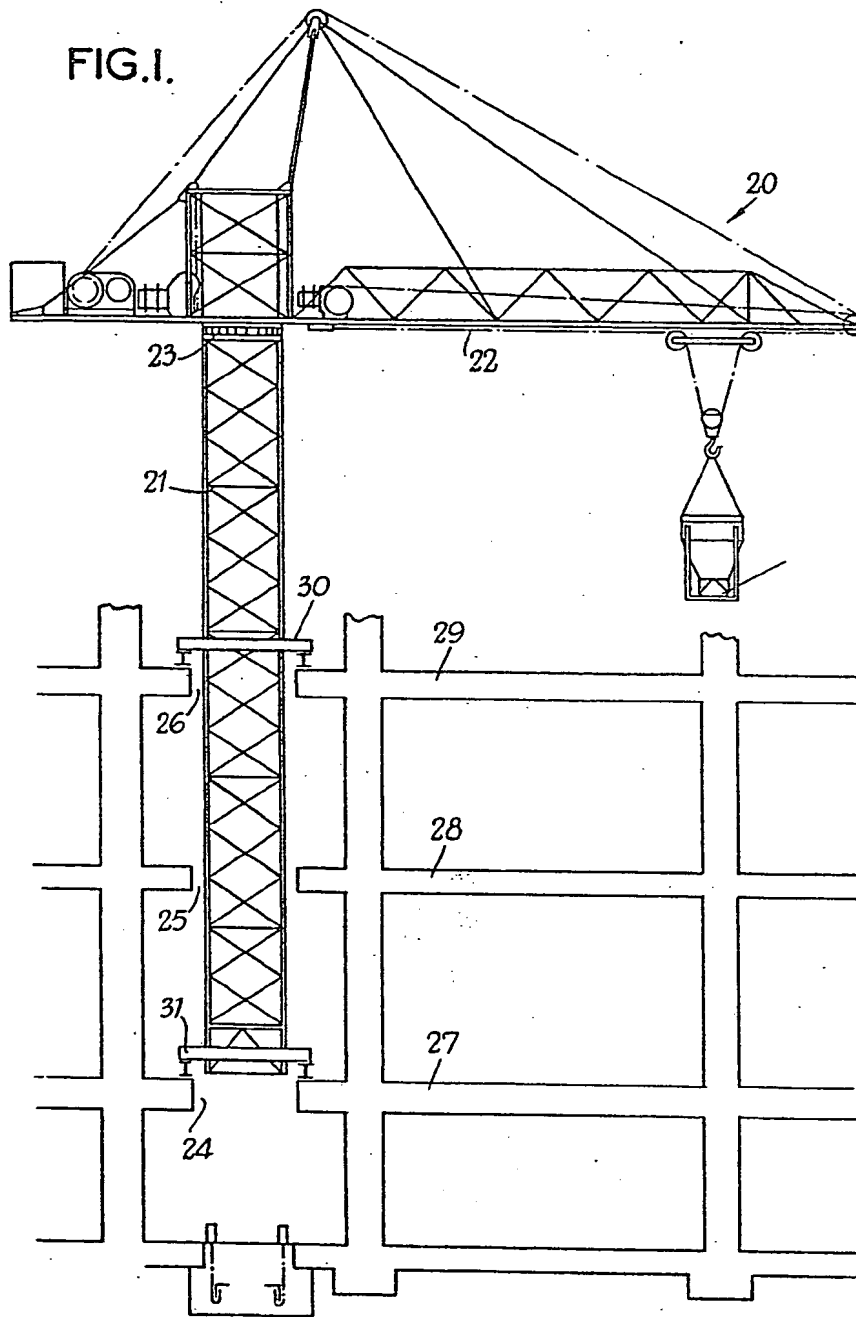
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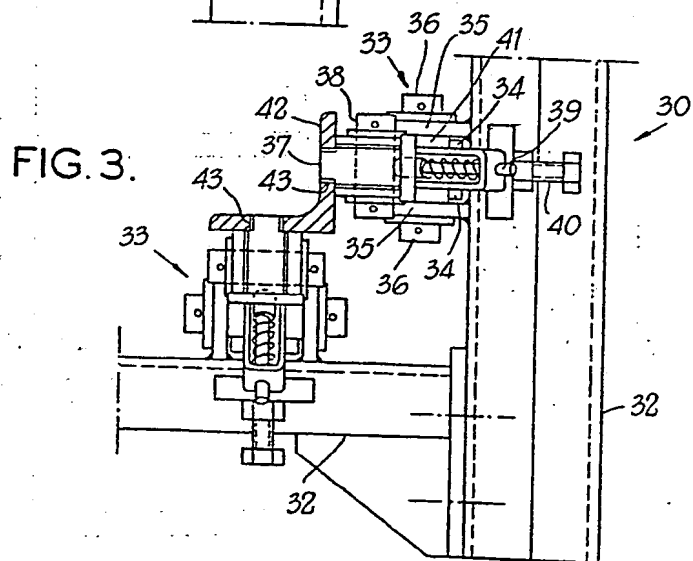
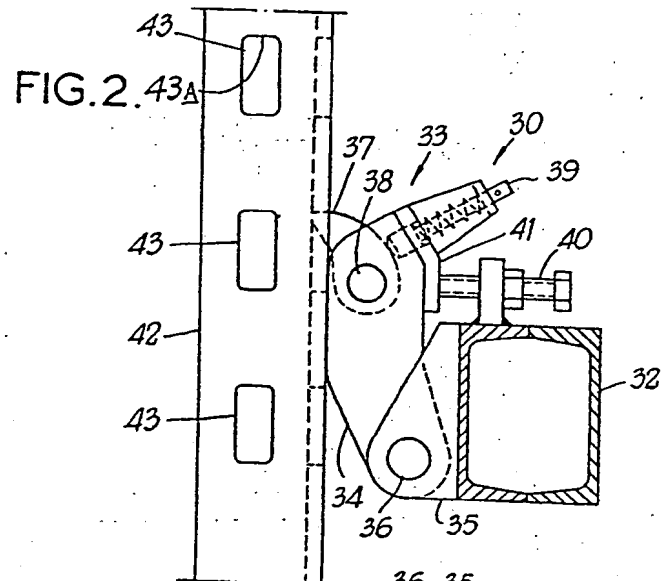
3 SHEETS

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Sheet 1

FIG.1.





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3 SHEETS

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Sheets 2 & 3

FIG.4.

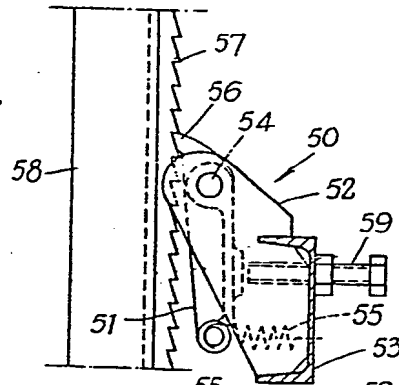


FIG.5.

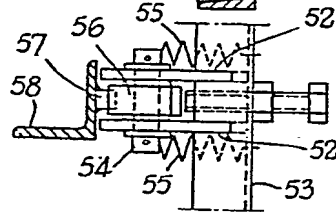


FIG.6.

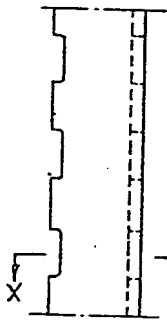


FIG.7.

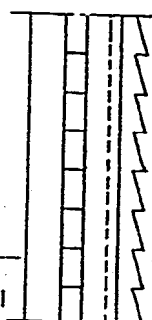


FIG.8.

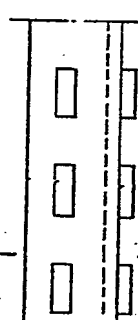


FIG.9.

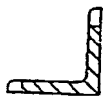
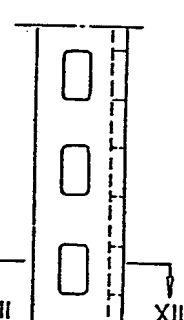


FIG.10.

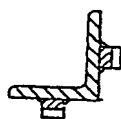


FIG.11.

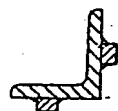
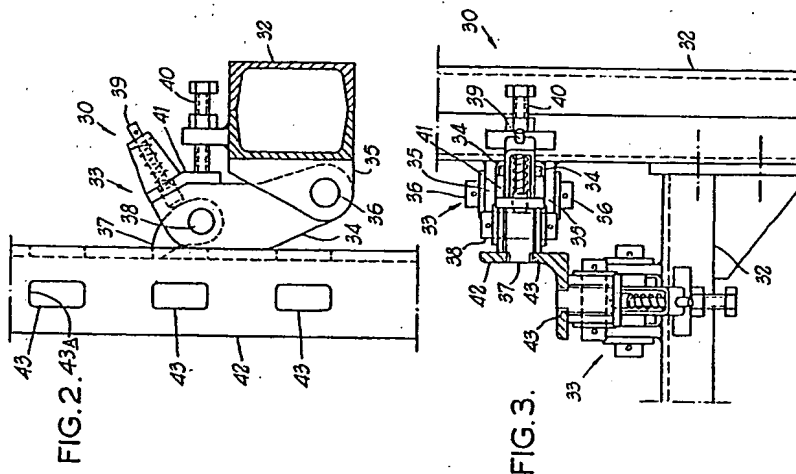
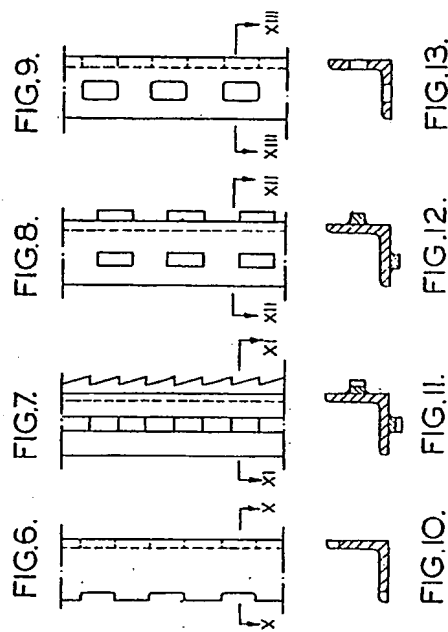
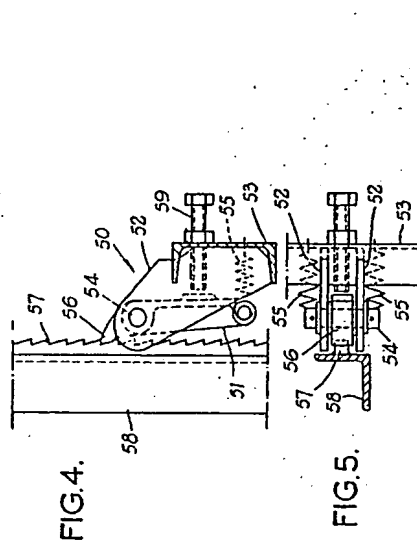


FIG.12.



FIG.13.



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